De biologie en methodologie van aanleg en omgeving

Summary

The nature-nurture problem is the subject of debates in the life sciences and the philosophy of science. In the life sciences, hereditarian explanations of phenomena are contrasted with environmental explanations. In the philosophy of science, rationalism is traditionally contrasted with empiricism, or, in modern methodological terms, deductivism takes issue with inductivism. The essence of these conflicting explanations between hereditarian and environmentalist theories, and of the contrast between deductivism and inductivism, has been described by K.R. Popper in the Bucket- and the Searchlight theories of the mind. According to the (empiricist) Bucket theory the mind is empty at birth, and subsequently filled with information received through our senses. Sense experiences form the basis from which general knowledge is inferred by induction. According to the (rationalist) Searchlight theory the mind is prestructured in such way as to be constitutive of at least the form of our knowledge, or, in the strongest version, to contain knowledge itself. In the latter case sense experience is only a trigger-mechanism. The fundamental opposition of these theories consists in the contrast between two basic explanatory schemes for the acquisition of general knowledge: instruction through repetition (Bucket theory) versus selection by trial and error elimination (Searchlight theory).

These views reappear, in all sort of guises, in the philosophy of science and in the life sciences. The evolutionary theories of Lamarck and Darwin are good examples of the latter. Lamarck's theory is representative of the empiricist strain, as the environment in that theory instructs the course of evolution. Darwin's theory is typical rationalist as inherited, and hence, already present, dispositions form the material of natural selection. As the basic explanatory schemes of heriditarian (or environmentalist) theories in the life sciences and the deductive (or inductive) methodology are structurally related, there are connections between 'substantial' theories and methodological styles of explanation. Heriditarians will adhere to the deductive style, whereas environmentalists will prefer the inductive style. These connections between 'substantial' theories in the life sciences and methodological styles of expla-

nations are further examined in this study. Therefore methodological problems and developments in the life sciences are studied in detail.

Chapters 2 examines the contrast between the deductive and inductive style of explanation. According to Popper the inductive style cannot predominate in the development of science. As inductive inferences cannot be logical (and epistemological) justified, Popper concludes that all developments in science can be reconstructed in terms of his deductive methodology. This position is criticized in chapter 2. Besides a deductive style, an inductive style is institutionalized in scientific practice. This style however is not organized as would be expected on the basis of the inductive philosophy. The central character of this philosophy, i.e. inductive inferences, does not form an essential part of the inductive style. Moreover hypotheses are not grounded in observation. Crucial for an adequate understanding of this style is the role of background theories. As hypotheses are developped by reformulating research problems in terms of background or accepted theories, such hypotheses are not deduced from a theory, as is the case in deductive problemsolving. Background theories determine the rules of the inductive style but are not criticized. The essence of the inductive style may be accurately described in terms of Kuhnian puzzlesolving.

This methodological critique of the ideas of Popper is extended with a critique of his Searchlight theory of the mind. According to this theory all observation statements are theory-loaded. However in scienctific practise not all statements function as hypotheses (nor are they justified by perceptual experiences, as is assumed by the Bucket theory of the mind). A further analysis of this problem of the empirical basis is done in chapter 4. The ideas of the philosopher L. Wittgenstein are used to explain the function of representation methods in science. Especially the notions samples and rules are of great use since these notions may be used to the explain the actions of scientists in the local research context. Furthermore these notions may be used to distinguish various ways of puzzlesolving as samples and rules are frequently used in experimental practises.

With the help of the methodological distinctions between the deductive and inductive style several developments in the life sciences are described in chapters 3, 5, 6 and 7. First, the question is posed whether the opposition between hereditarian and environmentalist theories is solved within the field of animal behaviour. To answer this question Chapter 3 examines two controversies between behaviorists and ethologists. It is argued that the dichotomy between nature and nurture is indeed solvable through puzzlesolving, although the theoretical contrast remains. On the level of testing hypotheses by preparing samples and

rules in experimental situations, the conflicts between ethologists and behaviorists are superseded. However the theoretical contrast remains as heriditarian and environmentalist theories still function as background knowledge for interpretations of concrete data. This explains why scientists are often seduced to the nature-nurture dichotomy when they are invited to discuss the nature-nurture problem in theoretical terms. It is no coincidence that the so-called interactionist hypothesis is defended with reference to experimental realism.

Chapters 5 and 6 examine differences in developments in the life science, the natural sciences and the behavioural sciences. Controversies in the borderlands between sociobiology and ethology, and between proponents of the biological and chemical approach within immunology, are discussed. The usefulness of the distinction between the deductive and inductive style for analyzing controversies is illustrated by relating this distinction to opposing approaches in the life science, as the opposition between ultimate-causal theories and proximate-causal theories, and the contrast between structuralist and functionalist approaches. The specific connections between such approaches and methodological styles are discussed and the consequences of these connections for the nature-nurture problem are analyzed. Although such connections do result in contrasting theories, samples may enhance consensus among representatives of opposing theories. The way samples enhance consensus however differs per specialty: within immunology for example samples are experimentally created while this is lacking in ethology and sociobiology.

Chapter 7 examines the use of the notions samples and rules for the explanation of differences between developments in the life science and the behavioural sciences. It is argued that ethologists have a special position within the behavioural sciences, which is made possible by one of the logical spaces of the concept of emotion. As emotions have characteristic expressions in the behaviour of man and animals, ethologists are in the priviliged position to study the species-characteristic expressions of emotions. This explains why ethologists are able to develop evolutionary puzzles. Psychologists, by contrast, do not study intelligent behaviour in an ethological manner. Specific controversies, as the controversy between behaviorists and mentalists, may be passed by ethologists, but still haunts psychologists as samples for psychological phenomena, which might enhance agreement in debates, are lacking.

It is concluded that the nature-nurture problem is far more complex as might be expected on the basis of Popper's Bucket- and Searchlight theories of the mind. Chapter 8 examines this increase in complexity. Specific positions in nature-nurture debates are systematically explai-

ned in terms of the methodological framework developped in this study. Finally the current state of the nature-nurture problem is discussed. It is concluded that the nature-nurture problem is solvable as an empirical puzzle, but remains however a controversial problem.